ESA-024-2 American Proteins - Hanceville, Alabama
Public Report

Introduction:
The Hanceville, Alabama Plant of American Proteins, Inc., processes inedible chicken (IC) into meals and oil for sale to the animal kingdom. The process consists of removing the water from IC via the use of steam a direct gas fired dryer. For every 100 pounds of raw material processed, the plant produces 34 pounds of meal or oil. The site has two manufacturing facilities, the Pet Food Plant and the Feed Grade Plant. The site also has a waste water treatment facility, and a truck fleet and garage, and a laboratory.

The Pet Food Plant process involves transporting IC into three TST-100 cookers where it is heated to well above boiling temperature to remove the water. Next, the IC is conveyed to a screen for partial removal of oils after which it is pressed into cake with minimal moisture content. The oil that was removed is cleaned via a two phase centrifuge. The cake is ground and classified to separate for production of regular and low ash meal.

The Feed Grade Plant contains feather, blood and IC processing systems. Feather processing consists of drying the feathers in a rotating, steam heated dryer to breakdown the material into digestible protein. The dried feathers are screened, ground and stored for shipment. The blood system operates by injecting live steam to coagulate the solids. The two-phase fluid is pumped to a centrifuge where the red blood cells are separated. The remaining fluid is cooled and pumped to a methane producing lagoon. The solids can be added to the feather product or feed grade meal.

The feed grade process starts with heating the IC for coagulation. The IC is then passed over a screen to drain water. The solids continue to presses to remove remaining water and fat. All liquid streams are heated before entering the waste heat evaporator where water is removed. The IC is then cooked to remove the remaining water, blood or oil before it is pressed, milled, and screened into animal feed.

Objective of ESA:
To introduce the US DOE Steam Suite of software tools to plant personnel and use the tools to identify energy saving opportunities related to the plant steam system.

Focus of Assessment:
Plant's steam system and US DOE steam software tools.

Approach for ESA:
The Steam System Assessment followed the following outline:
- Learned SSAT Software
- Built Base Case SSAT Model
- Examined 21 potential projects with SSAT
- Simulated 5 projects and evaluated savings with SSAT
- Learned 3EPlus Software (Insulation) – Highlighted plant insulation projects
- Reviewed DOE Steam System Tip Sheets
- Toured Plant
- Reviewed with plant personnel the ITP new technologies related to agricultural processing
- Reviewed the SSST provided by plant

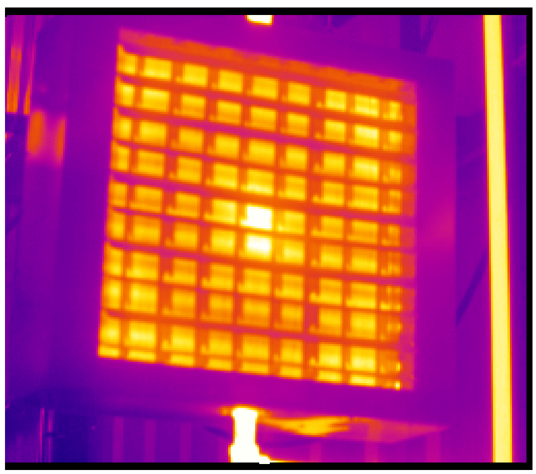
General Observations of Potential Opportunities:
The total plant natural gas cost for 2006 was $10,463,407.
The total plant electrical cost for 2006 was $2,187,230.

The impact fuel is natural gas and the cost determined by the plant personnel is $8.40/MMBtu and the impact electrical cost is $0.053/kWh.

<u>Near Term Opportunities:</u>

1. Install Thermostats on Steam Unit Space Heaters – There are 6-unit heaters used to warm the boiler house and other areas of the plant. The unit heaters are each rated of 490,000 Btu/hr output with 125 psig steam as the energy source. Past operating practice had the heaters operating continuously for the 4 months of the heating season, costing about $60,000/year to operate. It is estimated that the installation of thermostats will reduce the hours of operation by 25% during the 4 month heating season, saving $15,000 in natural gas annually (1,786 MMBtu). The cost of this project is expected to be $6,000, and the simple payback is 0.40 years.

Typical Unit Space Heater

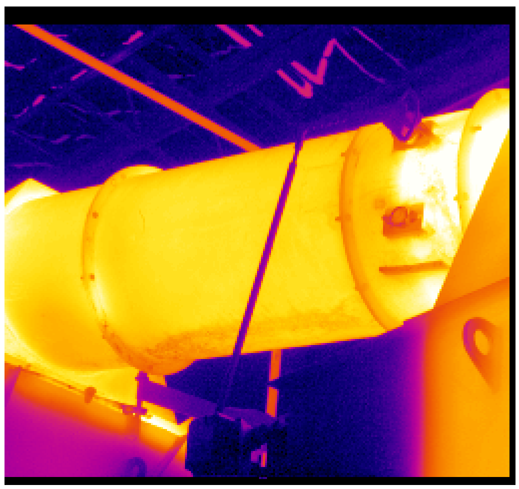


Infrared Image of Unit Heater in Operation

2. Improve Plant Insulation Systems – Over the years, many piping repairs and modifications have been made at the plant, and in some cases the insulation has not been replaced on the piping. In some cases, hot piping and ducting were never insulated. The 3EPlus software was used to quantify the savings possible from improving the plant insulation. The Table below summarizes the savings.

Description	Feet/Area (ft or sq-ft)	Bare (Btu/hr/ft)	2" Insulation (Btu/hr/ft)	Savings ($/ft/yr)	Annual Savings ($)
1" Pipe	24	310.60	43.37	19.72	473.28
1 ½" Pipe	10	435.00	58.54	27.78	277.80
2" Pipe	75	534.90	60.83	34.98	2,623.50
3" Pipe	180	768.80	79.00	50.90	9,162.00
4" Pipe	144	975.20	93.94	65.03	9,364.32
6" Pipe	94	1,410.00	126.40	94.77	8,908.38
8" Pipe	22	1,817.00	154.70	122.70	2,699.40
10" Pipe	57	2,246.00	171.60	153.10	8,726.70
12" Pipe	45	2,650.00	210.40	180.10	8,104.50
18" Pipe	18	3,707.00	296.90	251.70	4,530.60
Feather Dryer Ducting	240	317.40	22.74	21.74	5,217.60
Boiler FGR Ducting	190	1,124.00	60.12	78.47	14,909.00
Totals	669 ft & 430 sq-ft	NA	NA	NA	74,997.08

The total savings is estimated to be $74,997 of natural gas (8,928 MMBtu) annually. The estimated cost of improving the plant insulation is $35,000, which results in a simple payback of 0.47 years.



Uninsulated Flue Gas Recirculation Duct Boiler #12

3. Improve Boiler Efficiency by Reducing Excess Air – All boilers on site are controlled by Nexus automatic control systems that are tied together for data archiving. These automatic control systems should be capable of maintaining flue gas oxygen content in the 1.5% to 3.0% range from low fire to high fire. Data obtained from the Nexus systems indicate that the overall average oxygen level for the boilers when firing at 30% to 100% is between 4.0% to 6.0%. This indicates that more excess air than that required for safe operation is entering the boilers. It is recommended that the measured oxygen levels in the flue gases be verified and any air leaks into the stack before the measurement location be repaired. The measured oxygen level must represent the combustion conditions within the boiler. If the verified oxygen levels are indeed above the 1.5% to 3.0% range, then the Nexus systems should be tuned to reduce the excess air levels in the boilers. It is suspected that a 1% improvement in boiler efficiency across all 5 boilers on site is possible, saving $159,000 annually (18,929 MMBtu). The cost of verifying the oxygen measurements is estimated to be $10,000. The Nexus control systems are tuned by an outside company every 3 months, so there should be no additional expense to the plant for making the adjustments to the control systems. The simple payback is 0.06 years.

<u>Medium Term Opportunities:</u>

1. Install Economizer on Boiler #9 to Heat Wash Water – Flue gas temperature on boiler #9 ranges from 450 F to 475 F, providing an opportunity to capture and use waste heat for wash water heating. A standard condensing economizer can be installed in the stack of boiler #9 to heat 64 GPM of wash water from 75 F to 145 F. Because of the nature of the waste chicken processing business, hot wash water is used almost continuously for cleaning

trucks and other surfaces. Currently, direct steam injection is used to increase the temperature of the wash water by 70 F. The storage tank is not currently insulated and insulation should be added to reduce heat losses from the tank. Installation of the economizer heat exchanger will allow the wash water to be heated with stack gas energy that is currently being wasted. Annual natural gas savings are expected to be $150,000 (17,857 MMBtu) and the project cost is estimated at $350,000, giving a simple payback of 2.33 years.

2. Install Economizer on Boiler #12 to Preheat Boiler Makeup Water – Flue gas temperature on boiler #12 ranges from 375 F to 400 F, providing an opportunity to capture and use waste heat to preheat boiler makeup water. A standard condensing economizer can be installed in the stack of boiler #12 to heat 55 GPM of boiler makeup water from 80 F to 200 F. The blowdown heat recovery system should provide about 10 F of preheat, taking the incoming 70 F makeup water to 80 F. The economizer installed in the stack of boiler #12 can then heat the makeup water to 200 F. Insulation on the storage tank should be checked and upgraded as necessary. Installation of the economizer heat exchanger will allow the makeup water to be heated with stack gas energy that is currently being wasted. Annual natural gas savings are expected to be $220,000 (26,191 MMBtu) and the project cost is estimated at $350,000, giving a simple payback of 1.59 years.

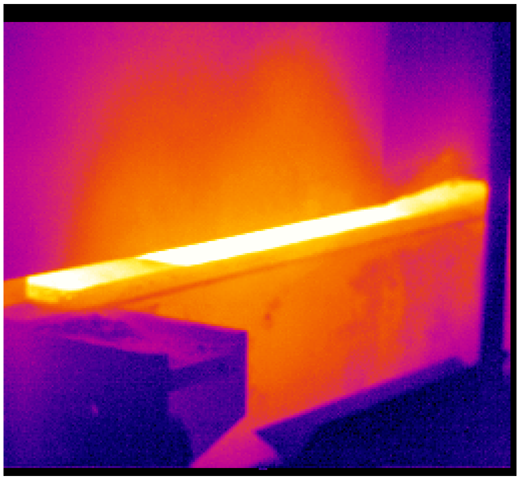
<u>Long Term Opportunities:</u>
No long term opportunities were identified during the assessment.

<u>Estimated Percentage Natural Gas and Electricity Savings (2006: 1,245,644 MCF and 41,268,491 kWh):</u>

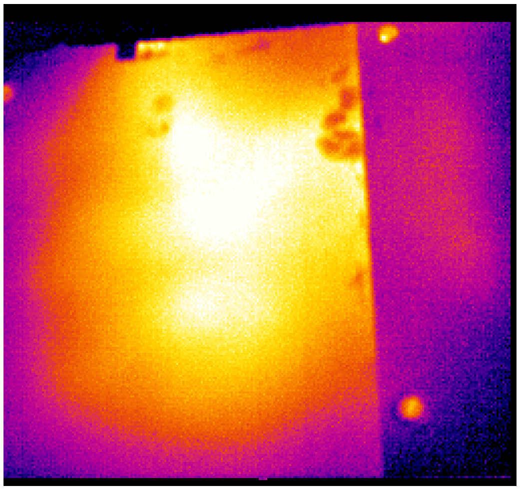
Near Term Opportunities	(29,643 MMBtu/year)	2.38 %;	(0 kWh)	0.00 %
Medium Term Opportunities	(44,048 MMBtu/year)	3.54 %;	(0 kWh)	0.00 %

Management Support and Comments:
Plant management is very committed to improving the energy efficiency of their facility. Staff preparation for the Steam Assessment was excellent, with all software downloaded and explored prior to the assessment. Staff had participated in a DOE web cast explaining the focus of the ESA.

An infrared imaging camera was used to inspect the exterior boiler surfaces to identify areas where refractory has deteriorated and elevated heat loss is occurring. While to energy cost associated with boiler skin heat losses is usually not large, the potential impact on boiler availability and system reliability can be important. Boilers #9 and #10 have areas of elevated temperature on the boiler shell that should be addressed as soon as possible. Infrared images of those two areas are included below.



Boiler #9 Rear Heat losses



Boiler #10 Side Refractory Problem

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